

Communication System and Avionics for Deployable Small Free Flying Payloads

Completed Technology Project (2016 - 2017)



Project Introduction

This IRAD will develop a core part of the communication system for the small free flying payloads. In particular, this portion of the system will consist of the circuitry for modulation, data transmission, and power amplification for the deployable sub payload. The development is a key part in the complete communication system which will include the main payload receiving system that will process the data transmissions for up to 48 instrumented sub payloads. The communication system will be used on suborbital platforms where telemetry on deployable free flying payloads is required. Current capabilities for this number of telemetered deployable bodies do not exist at this time, so this development will enable deployable sub payloads to collect scientific data in constellation configurations where otherwise impossible.

The objective of the project is to have a functional communication system (data and transmission) for a single deployable sub payload.

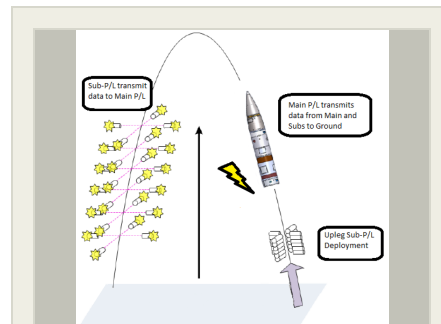
The innovative features of this project:

- Development of a core part (sub payload compact transmission system) of direct link communications between multiple payload bodies (currently, capability is not available).
- Currently, the small size of the deployables prevents the use of off the shelf components to be utilized and necessitates the need for a compact design to meet the specific form factor (Length = 5in, 3.4in Diameter).

At the completion of the IRAD, if awarded, the intent is to produce a printed circuit board (PCB) that will be used for the encoding (for this IRAD, a fixed data pattern will be used) and signal conditioning of the data as well as for the circuitry for the power amplifier (PA) and data handling unit.

Anticipated Benefits

- Health and status of chemical release deployable free flying payloads for upper atmosphere research
- Alternative to downlinked data from individual experiment instruments on deployed sub payloads for plasma and high energy astrophysics science that would require additional Ground Station support assets



Main and Sub payload Communications system

Table of Contents

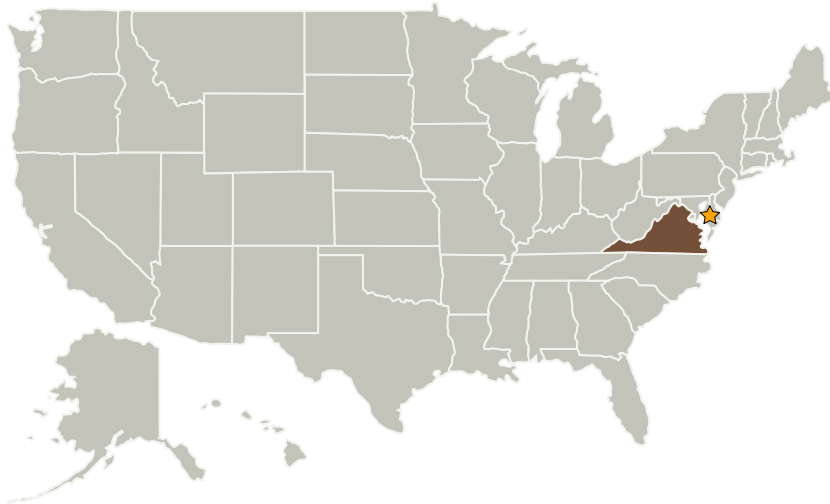
| | |
|--|---|
| Project Introduction | 1 |
| Anticipated Benefits | 1 |
| Primary U.S. Work Locations and Key Partners | 2 |
| Project Transitions | 2 |
| Organizational Responsibility | 2 |
| Project Management | 2 |
| Images | 3 |
| Project Website: | 3 |
| Technology Maturity (TRL) | 3 |
| Technology Areas | 3 |
| Target Destination | 3 |

Communication System and Avionics for Deployable Small Free Flying Payloads

Completed Technology Project (2016 - 2017)



Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|--------------------------------|-------------------|---------------|--------------------------|
| ★ Wallops Flight Facility(WFF) | Lead Organization | NASA Facility | Wallops Island, Virginia |

Primary U.S. Work Locations

Virginia

Project Transitions

▶ **October 2016:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Wallops Flight Facility (WFF)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

Daniel A Mullinix
Wesley A Powell

Principal Investigator:

Brian H Banks

Co-Investigator:

Christian V Amey

Communication System and Avionics for Deployable Small Free Flying Payloads

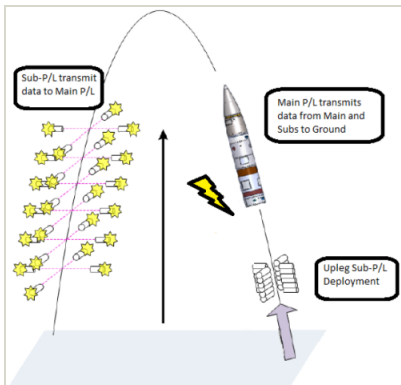
Completed Technology Project (2016 - 2017)



✓ September 2017: Closed out

Closeout Summary: The purpose of the Goddard Space Flight Center's Internal Research and Development (IRAD) program is to support new technology development and to address scientific challenges. Each year, Principal Investigators (PIs) submit IRAD proposals and compete for funding for their development projects. Goddard's IRAD program supports eight Lines of Business: Astrophysics; Communications and Navigation; Cross-Cutting Technology and Capabilities; Earth Science; Heliophysics; Planetary Science; Science Small Satellites Technology; and Suborbital Platforms and Range Services. Task progress is evaluated twice a year at the Mid-term IRAD review and the end of the year. When the funding period has ended, the PIs compete again for IRAD funding or seek new sources of development and research funding or agree to external partnerships and collaborations. In some cases, when the development work has reached the appropriate Technology Readiness Level (TRL) level, the product is integrated into an actual NASA mission or used to support other government agencies. The technology may also be licensed out to the industry. The completion of a project does not necessarily indicate that the development work has stopped. The work could potentially continue in the future as a follow-on IRAD; or used in collaboration or partnership with Academia, Industry and other Government Agencies. If you are interested in partnering with NASA, see the TechPort Partnerships documentation available on the TechPort Help tab. <http://techport.nasa.gov/help>

Images



Main and Sub payload comms

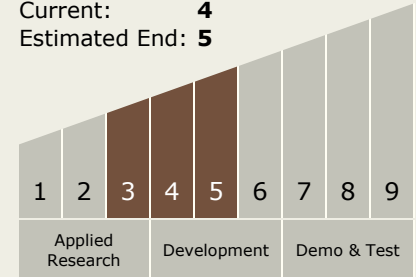
Main and Sub payload Communications system
(<https://techport.nasa.gov/image/25994>)

Project Website:

<http://aetd.gsfc.nasa.gov>

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - ↳ TX05.2 Radio Frequency

Target Destination

Earth